11646 - Light Echoes as Probes of Supernova Type Ia Environments

Cycle: 17, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

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VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) SN2006X	WFC3/UVIS	1	30-Jun-2009 22:47:28.0	yes
02	(2) SN1998BU	WFC3/UVIS	2	30-Jun-2009 22:47:33.0	yes

3 Total Orbits Used

ABSTRACT

Environmental factors of Type Ia supernovae are key in understanding their nature, lightcurve evolution, and utility as cosmological standard candles. The progenitor ages (and many other properties) are bimodal, differing by roughly an order of magnitude. Is this reflected as well in the differences in their immediate surroundings in terms of gas and dust? The most powerful and direct way to address this issue is by imaging the reflected light from the dust itself via a light echo. In order for this approach to work, however, one must start imaging the vicinity of the supernova frequently and soon after the explosion is seen. We propose to maintain the imaging sequences crucial for understanding the three-dimensional dust distribution of two recent and key Type Ia supernovae, in a timely manner that will prevent otherwise significant holes in our knowledge. These observations are likely to be important in determining if the interstellar versus the circumstellar environments are more important in determining the

appearance of Type Ia explosions, and thereby offer a clue as to the poorly-understood mass-loss history of SN Ia progenitors.

JUSTIFICATION FOR VISIT TIME CONSTRAINTS:
We have requested "Before" conditions

OBSERVING DESCRIPTION

Our proposed exposure times and the expected signals to be returned by HST are reliably anticipated from previous exposures of earlier incarnations of these sources using imagers other than WFC3/UVIS. For SN 2006X our main priority will be to best determine the new echo geometry, hence we will use much of the 1 orbit requested for F555W observations (about 970s) that will define the echo locus most efficiently and match previous observations. We will also devote about 970s to F475W and 270s for F775W to provide sensitivity to any color change and to provide a reasonable match to previous HST/WFPC2 observations. For SN 1998bu we will make similar observations, but go deeper in the "echo geometry band" (F606W) and also include a deep exposure in F658N to capture optimally any non-echo CSM signal and provide an H-alpha line strength.

JUSTIFICATION FOR VISIT TIMING REQUIREMENTS:
We have requested a "Before" condition in the Visit Timing Requirements due to the rapidly changing nature of these targets' evolution and the unanticipated extension of the interval since the previous observations, in light of Servicing Mission 4. This is particularly critical in the case of SN 2006X (Target 1); there was a rapid series of HST images taken in May 2006 - January 2008, followed by an 18+ month delay. This time gap must be closed as soon as possible. The same argument applies to SN 1998bu (Target 2) but is less critical. There were five relevant epochs of HST imaging prior to January 2006, followed by a 42+ month delay. Closing these gaps as soon as possible increases the likelihood of maintaining adequate light echo coverage to 3-dimensionally map the surrounding material commensurate with the angular resolution of HST, which cannot be retrieved from later observations. Please, if at all possible, try to implement these Before conditions. Of course, the observations will still be of great value even if this is impossible.

Visit

Proposal 11646, Visit 01, implementation Wed Jul 01 02:47:37 GMT 2009

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

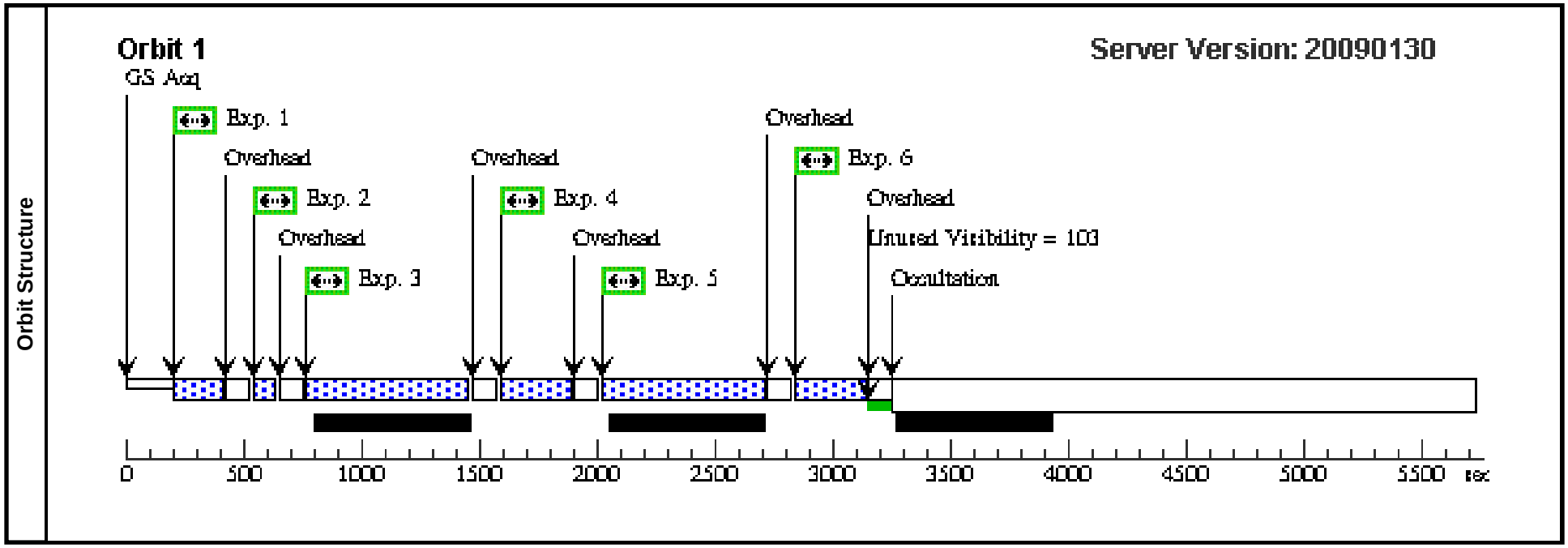
Special Requirements: BEFORE 15-NOV-2009:11:59:00

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SN2006X	RA: 12 22 53.8800 (185.7245000d) Dec: +15 48 31.90 (15.80886d) Equinox: J2000		V=23	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	SN2006X-F775W-1	(1) SN2006X	WFC3/UVIS, ACCUM, UVIS1-FIX	F775W	CR-SPLIT=NO	GS ACQ SCENARIO SINGLE		180 Secs *[==>]*	 ***[1]***
2	SN2006X-F775W-2	(1) SN2006X	WFC3/UVIS, ACCUM, UVIS1-FIX	F775W	CR-SPLIT=NO			90 Secs *[==>]*	 ***[1]***
3	SN2006X-F475W-1	(1) SN2006X	WFC3/UVIS, ACCUM, UVIS1-FIX	F475W	CR-SPLIT=NO			670 Secs *[==>]*	 ***[1]***
4	SN2006X-F475W-2	(1) SN2006X	WFC3/UVIS, ACCUM, UVIS1-FIX	F475W	CR-SPLIT=NO			300 Secs *[==>]*	 ***[1]***
5	SN2006X-F555W-1	(1) SN2006X	WFC3/UVIS, ACCUM, UVIS1-FIX	F555W	CR-SPLIT=NO			670 Secs *[==>]*	 ***[1]***
6	SN2006X-F555W-2	(1) SN2006X	WFC3/UVIS, ACCUM, UVIS1-FIX	F555W	CR-SPLIT=NO			300 Secs *[==>]*	 ***[1]***


Orbit Structure
Orbit 1
Server Version: 20090130
GS Acq
Exp. 1
Overhead
Exp. 2
Overhead
Exp. 3
Overhead
Exp. 4
Overhead
Exp. 5
Overhead
Exp. 6
Overhead
Unused Vitibility = 103
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 11646, Visit 02, implementation Wed Jul 01 02:47:38 GMT 2009

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

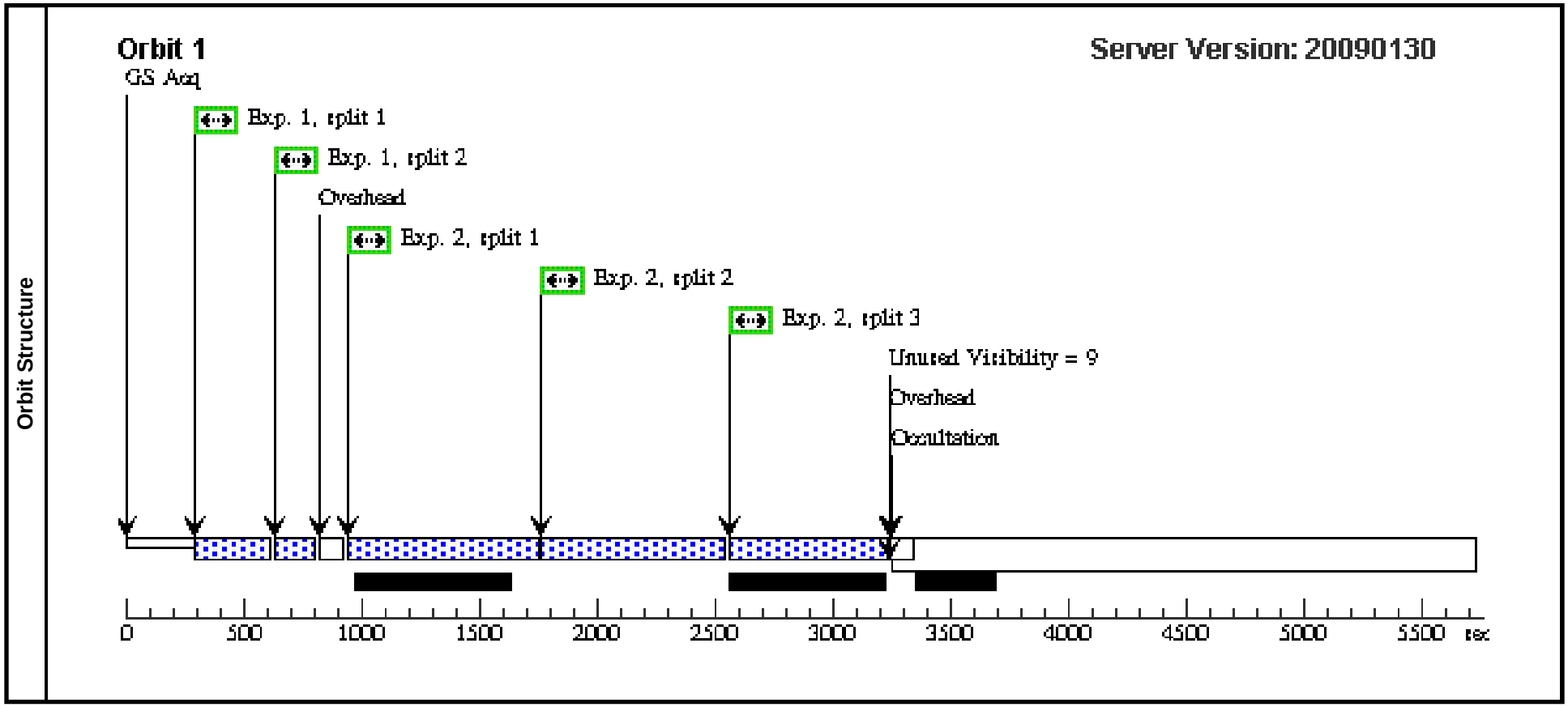
Special Requirements: BEFORE 15-NOV-2009:11:59:00

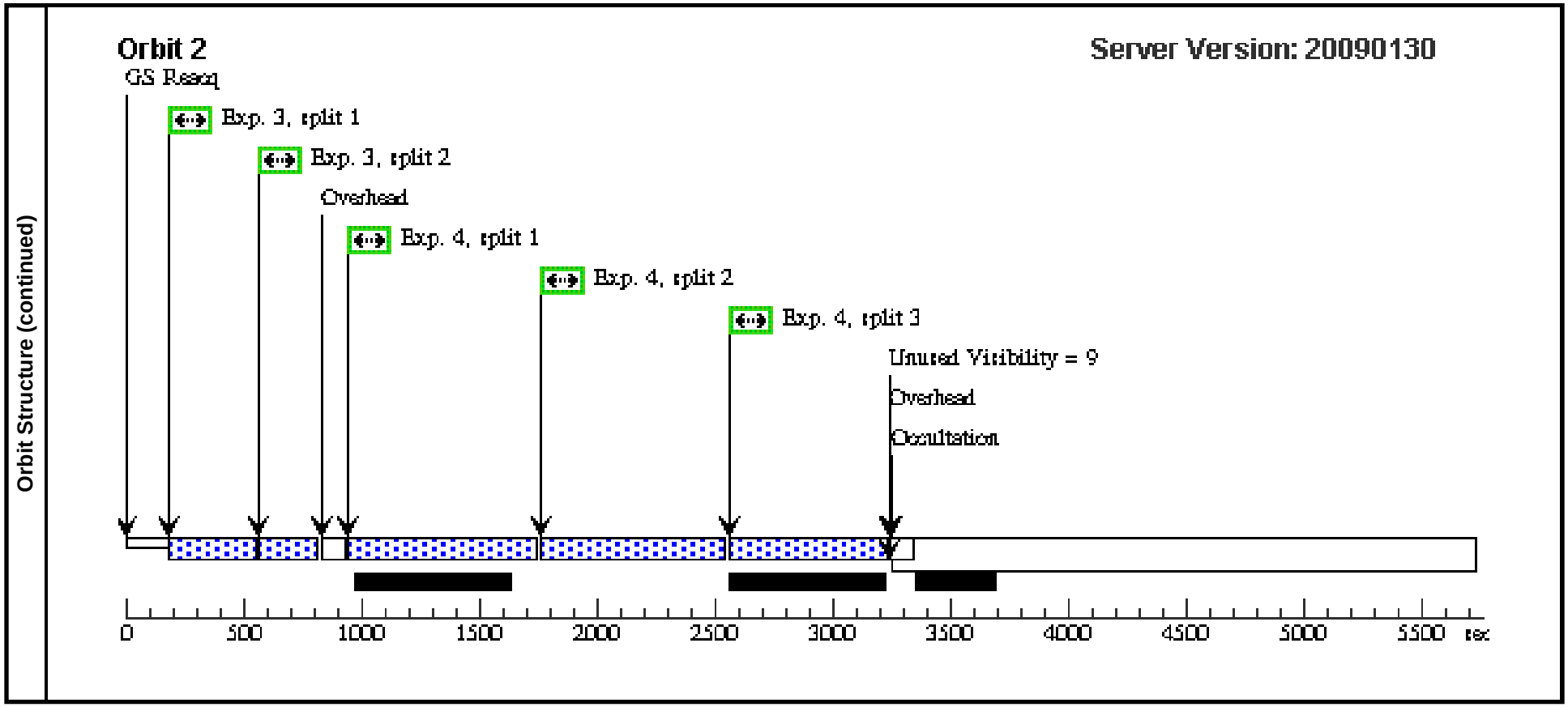
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	SN1998BU	RA: 10 46 46.0900 (161.6920417d) Dec: +11 50 7.00 (11.83528d) Equinox: J2000		V=23	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	SN1998BU-F814W-CRS2	(2) SN1998BU	WFC3/UVIS, ACCUM, UVIS1-FIX	F814W	CR-SPLIT=2			350 Secs *[==>(Split 1)]* *[==>(Split 2)]*	 ***[1]***
2	SN1998BU-F606W-CRS3	(2) SN1998BU	WFC3/UVIS, ACCUM, UVIS1-FIX	F606W	CR-SPLIT=3			2010 Secs *[==>(Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]*	 ***[1]***
3	SN1998BU-F475W-CRS2	(2) SN1998BU	WFC3/UVIS, ACCUM, UVIS1-FIX	F475W				500 Secs *[==>(Split 1)]* *[==>(Split 2)]*	 ***[2]***
4	SN1998BU-F658N-CRS3	(2) SN1998BU	WFC3/UVIS, ACCUM, UVIS1-FIX	F658N	CR-SPLIT=3			2010 Secs *[==>(Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]*	 ***[2]***


Orbit Structure
Orbit 1
Server Version: 20090130
GS Acq
Exp. 1, split 1
Exp. 1, split 2
Overhead
Exp. 2, split 1
Exp. 2, split 2
Exp. 2, split 3
Unused Visibility = 9
Overhead
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec


Orbit Structure (continued)
Orbit 2
Server Version: 20090130
GS Reacq
Exp. 3, split 1
Exp. 3, split 2
Overhead
Exp. 4, split 1
Exp. 4, split 2
Exp. 4, split 3
Unused Visibility = 9
Overhead
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec